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(54) **Heating gas convection ovens**

(57) Referring to Figure 1 of the drawings, a gas convection oven comprises an insulated oven cavity 1 having a fan 2 surrounded by heater coil 4. One end of the heater coil is provided with a suction fan 5 exhausting outside the oven cavity, while at the other is a burner also drawing its air supply from outside the heater cavity. An annular passageway around the burner provides a stream of air between the flames and the wall of the heater coil. The heater coil may consist of more than one turn and it may be of corrugated stainless steel tubing. Preferably the suction fan operates continuously and the gas supply is turned on and off by solenoid valves under control of the oven thermostat. The circulating fan within the oven may be reversible.

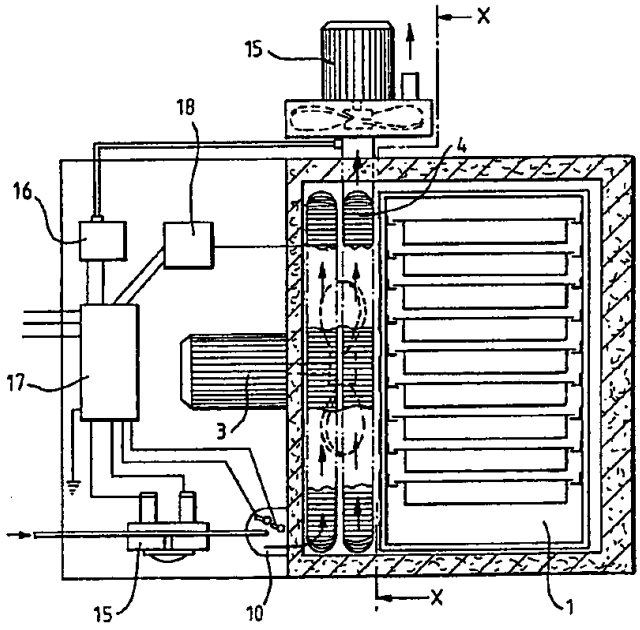

FIG.1.

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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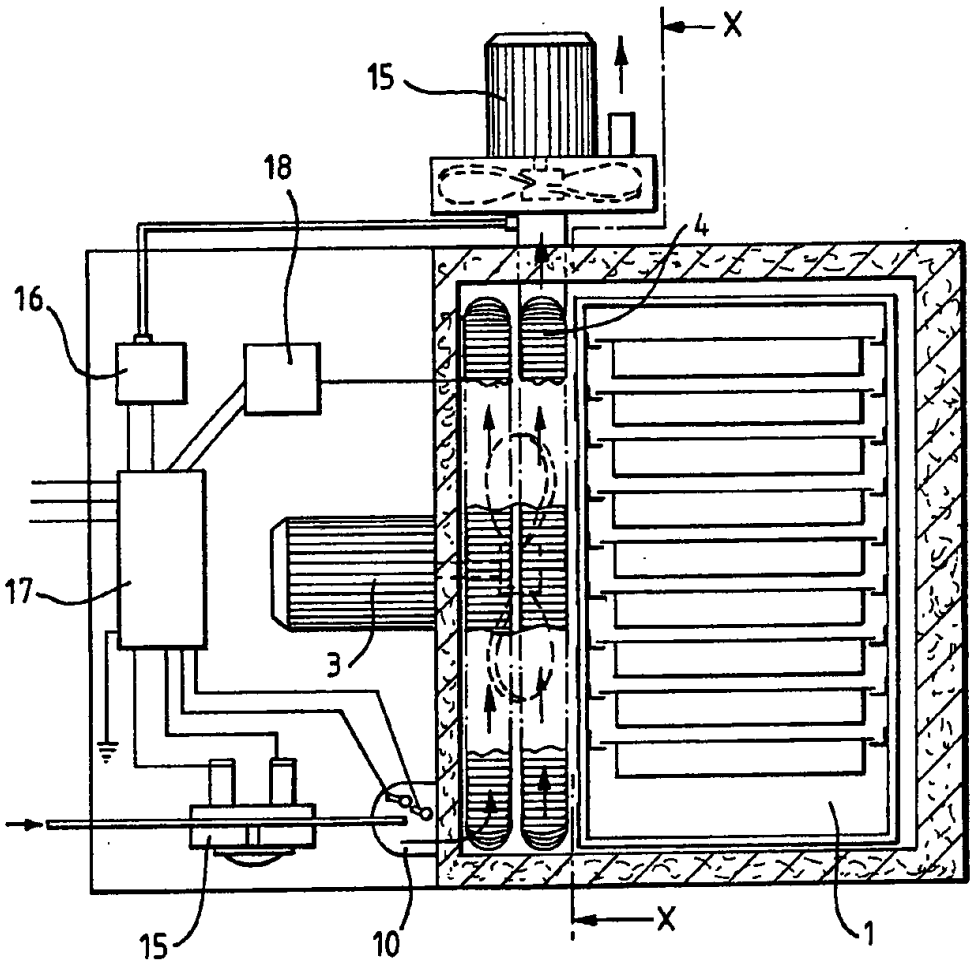

FIG.1.

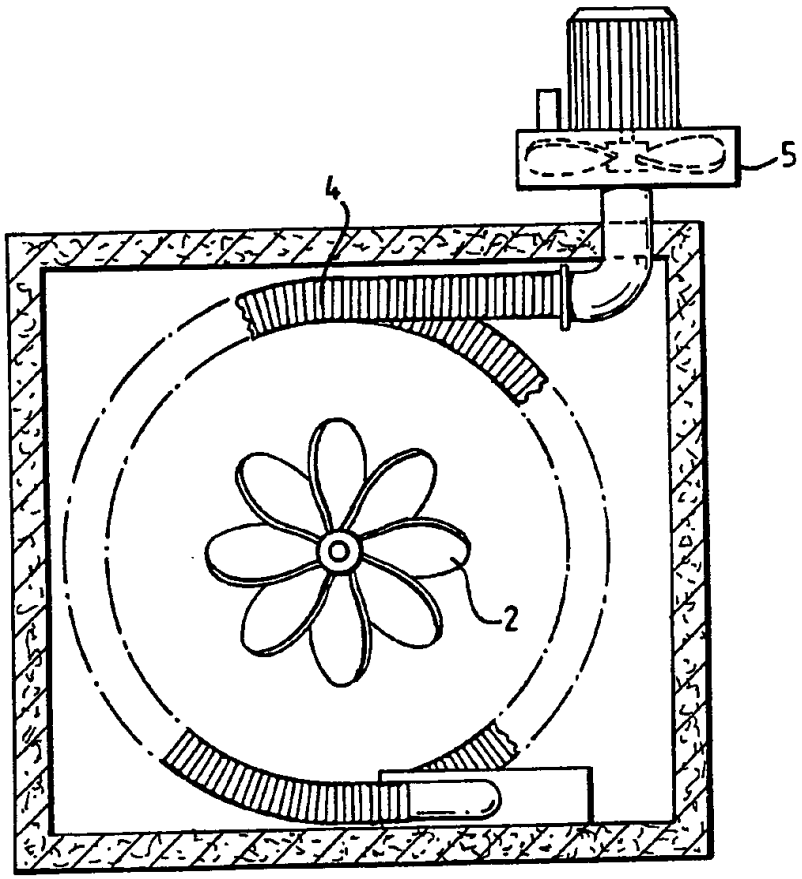

FIG.2.

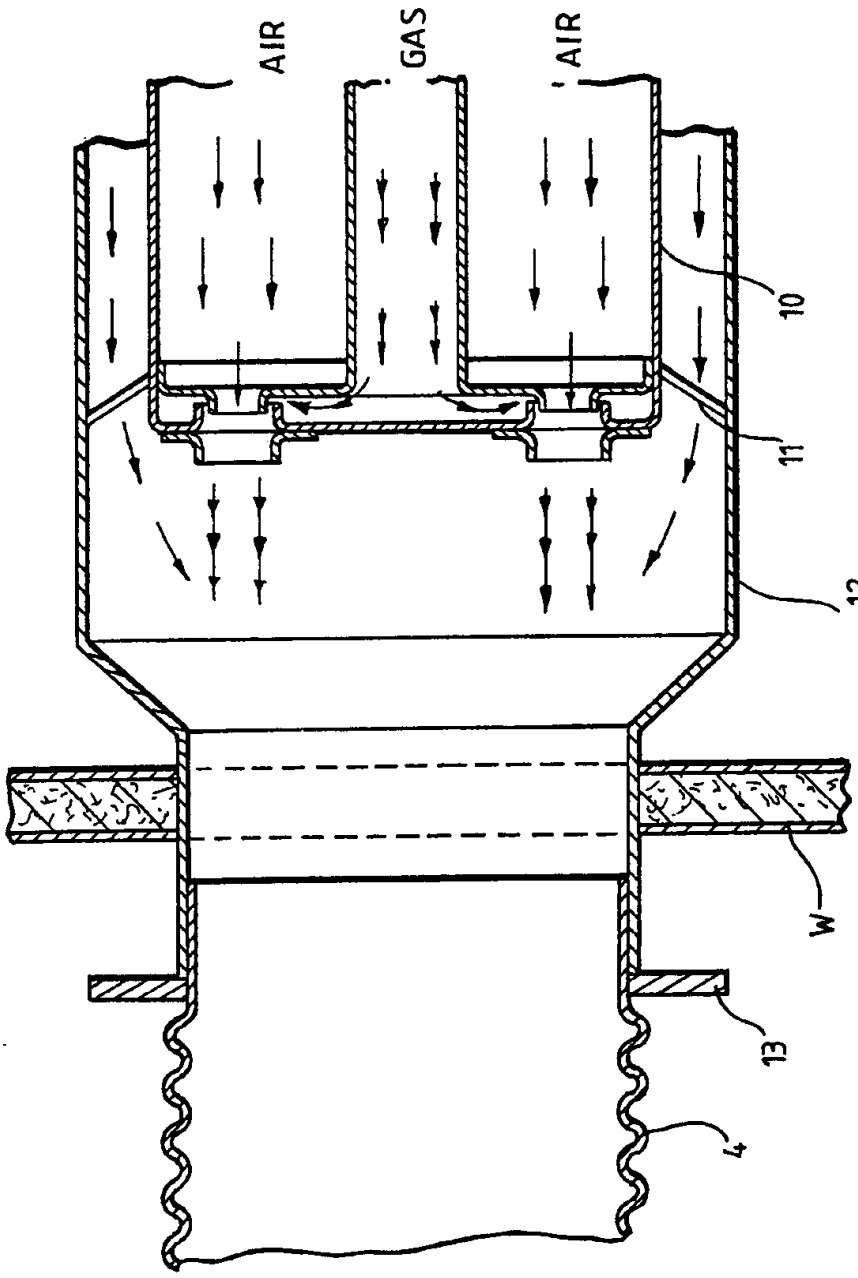

FIG.3.

GAS CONVECTION OVEN

This invention relates to gas ovens and particularly to a convection oven which is gas heated.

Hitherto gas ovens have normally been directly heated that is to say the burner flames have fired directly into the oven cavity. In a convection oven the increased air velocity causes products of combustion to mix with the fresh air at the burner head causing the flame to be extinguised or to be blown off the head of the burner. Furthermore, the flames have usually been proportionately regulated so that the burners are not always operating at the setting at which their efficiency is a maximum. Another disadvantage is that while periodic reversal of the circulating fan has been shown to be desirable for giving an even heat distribution causes further deterioration in the burner flame performance.

It is an object of the present invention to provide an improved design of gas convection oven which overcomes these difficulties.

In the present invention which is defined in the claims appended hereto, the heater is in the form of a tube having no communication with the interior of the oven cavity and which has a gas burner at one end and a suction fan at the other. The flame profile can be controlled using the suction fan to control the amount of

heating provided to the interior of the oven. The air velocity resulting from the suction fan, the tube diameter and gas flow are matched to provide high energy efficiency. The burner is preferably positioned so that an annular stream of air is drawn in around it, which gives a very even heat release and shields the walls of the heater tube from the flame.

One example of an oven according to the invention will be described with reference to the accompanying drawings in which;

Figure 1 is a diagrammatic elevational section of an oven according to the invention;

Figure 2 is a further section along the plane indicated by X-X in Figure 1, and

Figure 3 is an axial section through the burner and the input end of the heater tube.

Referring first to the Figures 1 and 2 the oven comprises an insulated cavity (1) within which is positioned a fan (2) driven by an electric motor (3) which preferably is reversible and is arranged to change its direction of rotation at predetermined intervals.

Surrounding the fan (2) is a heater coil (4) of stainless steel. Although this could be of plain tubing, preferably it has a corrugated wall and preferably also it is demountable for cleaning, fitting into sockets provided

through the oven cavity wall. The corrugated wall has the advantages first, that by making the tube flexible it is easier to fit it and remove it for cleaning and, further, as will be described more fully below, the corrugations increase the turbulence of the gases flowing through it and improve the transfer of heat.

At one end of the tube, outside the cooker cavity is a suction fan (5) arranged to draw air and gas through the tube whereas, at the other end the tube is enlarged to receive a burner. Air is drawn into the enlarged end from outside the oven cavity and preferably, the enlarged end and the burners are situated outside the main insulated oven cavity.

Figure 3 shows the section of the enlarged end of the heater tube and the burner its self in more detail. The burner (10) is of a known type, for example, the Lane mark "Thermimax" (Registered Trade Mark) and, is mounted by a spider system (11) within an enlarged tube section (12) passing through the insulated wall (W) of the oven cavity. This enlarged section terminates in a cup (13) just within the oven cavity wall, into which a collar at the end of the corrugated section of the heater coil (4) can plug.

The manner in which the burner is supported provides an annular space surrounding it through which air is drawn

when the suction fan is operating. This stream of cooler air surrounding the hot gases from the burner allows an even heat release and protects the initial section of the heater coil from becoming overheated. As the gases progress along the heater coil the flow becomes turbulent assisted by the corrugations in the heater coil wall and aiding the transfer of heat through the coil.

Referring again to Figure 1, the supply of gas to the burner is controlled by a solenoid valve (15). A pressure responsive switch (16) responds to the pressure at the inlet of the suction fan (5) and ensures that the burner is not supplied with gas unless the suction fan is running. An electronic programmer (17) receives inputs from the pressure responsive switch (16) and from the oven thermostat (18) and also from the flame detector of the burner (10) and controls the solenoid valve (15) and energises the burner igniter as appropriate.

In operation when the oven thermostat is turned up from its zero position, the programmer (17) switches on the suction fan (5) and opens the gas solenoid valve to admit gas to the burner at a low rate. Provided the ignition of the gases at the burner head is detected by a sensing probe within a preset delay the gas supply to the burner head is increased to its normal maximum rate, by means of a second section of the solenoid valve.

When the preset oven cavity temperature has been reached the thermostat contacts open and the programmer closes both solenoid valves and the flames is extinguished. The suction fan (5) and the air pulled through the heat exchanger tends to cool the walls and thereby produces a cooling effect on the air circulating within the oven cavity, the thermostat reopens and the heating cycle recommences.

It has been shown that the efficiency of heat transfer with this system, is increased over other known systems in that only about 20% of the heat generated is exhausted from the heat exchanger by the suction fan. In large ovens two systems of the kind described may be incorporated to give the maximum uniformity of heat distribution.

CLAIMS

1. A gas convection oven comprising an insulated oven cavity, a heater and a fan arranged to circulate air within the cavity and over the heater, wherein the heater comprises a tube having its ends opening outside the oven cavity and including a suction fan at one end and a gas burner at the other and, with the burner mounted in the region of the open end of the heater tube so as to allow a stream of air to be drawn in between the burner flame and the wall of the heater tube.

2. An oven according to claim 1 in which the heater tube is coiled to form more than one turn surrounding the circulatory fan.

3. An oven according to claim 1 or claim 2 in which the heater tube is corrugated.

4. An oven according to any preceding claim in which the heater tube is removable for cleaning.

5. An oven according to any preceding claim wherein the stream of air is of annular form.

6. An oven according to any preceding claim in which the heater suction fan operates continuously and the gas supply to the burner is turned on and off by a solenoid valve under the control of the oven thermostat.

7. An oven according to any preceding claim in which the circulatory fan is arranged to reverse its direction of rotation periodically.

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